

1           1.       A system for receiving and processing MPEG data comprising:  
2           a digital tuner for receiving a data channel containing an MPEG coded data stream;  
3           a decoding system including a frequency converter module disposed to transform  
4 frequency coefficients in the MPEG coded data stream to a spatial domain to obtain spatial  
5 domain data associated with the MPEG data, a subsampling module for subsampling the  
6 spatial domain data by a selected factor to generate subsampled spatial domain data, and a  
7 motion vector module disposed to receive motion vector and reference image data in the  
8 MPEG coded data stream, the decoding system configured to process a reference frame  
9 and motion vectors of the MPEG data to generate predicted frame data;  
10          a first summer for adding the predicted frame data and the subsampled spatial  
11 domain data to generate first video images encoded in a reduced volume of video data; and  
12          a frame buffer disposed to buffer frames of the first video images.

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14           2.       The invention as recited in claim 1, wherein the MPEG coded data is  
15 capable of being decoded to produce video images in a first video resolution that is greater  
16 than a second video resolution, the first video images having the second video resolution,  
17 the invention further comprising:

18          a display device configured to display video in the second video resolution, the  
19 display device coupled to the frame buffer so as to display the first video images.

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21           3.       The invention as recited in claim 2, wherein the display device comprises a  
22 standard television monitor.  
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1           4.     The invention as recited in claim 2, wherein the display device is a first  
2 display device, the invention further comprising:

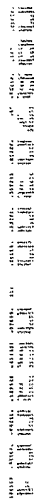
3           a second display device configured to display video in the first video resolution;  
4 and

5           a second summer for adding the predicted frame data and non-subsampled spatial  
6 domain data to generate second video images formatted for display in the first video  
7 resolution on the second display device, wherein the second video images are displayed on  
8 the second display device in the first video resolution.  
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10          5.     The invention as recited in claim 4, wherein the second display device  
11 comprises a high definition television.  
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13          6.     The invention as recited in claim 4, wherein the first display device and the  
14 second display device are components of a picture-in-picture display device, the first  
15 display device configured to display the first video images have the second video  
16 resolution in a reduced-size window of the picture-in-picture display, the second display  
17 device configured to display the second video images in the second video resolution  
18 outside of the reduced-size window of the picture-in-picture display.  
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20          7.     The invention as recited in claim 1, further comprising:  
21           a display device configured to display video in the first video resolution; and  
22           a second summer for adding the predicted frame data and non-subsampled spatial  
23 domain data to generate second video images formatted for display in the first video



1 resolution on the display device, wherein the second video images are displayed on the  
2 second display device in the first video resolution.

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4 8. The invention as recited in claim 7, wherein the display device comprises a  
5 high definition television.  
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1           9.     A computer program product for implementing, in a system for processing  
2 MPEG data in preparation for displaying video images encoded in the MPEG data, a  
3 method for subsampling the MPEG data to reduce the volume of video data processed to  
4 selectively display video images based on a reduced volume of video data, the computer  
5 program product comprising:

6           a computer-readable medium carrying computer-executable instructions capable of  
7 causing the system to perform the acts of

8           processing the MPEG data to generate a reconstructed digital video stream capable  
9 of producing video images in a first video resolution,

10          receiving a request for displaying video images having a second video resolution;

11          subsampling the MPEG data to obtain a reduced volume reconstructed digital video  
12 stream corresponding to the second video resolution that is less than the first video  
13 resolution, wherein the subsampled MPEG data is subsampled without generating a  
14 version of the subsampled data in the first video resolution;

15          and selectively presenting either or both of the first and second reconstructed  
16 digital video streams.

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18          10.    The invention of claim 9 wherein the act of subsampling comprises:

19          processing one or more motion vectors in order to produce coordinates for fetching  
20 prediction data from a previously decoded and subsampled reference frame;

21          processing the reference frame and the one or more motion vectors of the MPEG  
22 data using a frame prediction module to generate predicted subsampled frame data;

23          processing frequency coefficients of the MPEG data using an inverse discrete  
24 cosine transformer (IDCT) to generate IDCT output data;

1           decimating the IDCT output data by a selected factor to generate decimated IDCT  
2 output data; and

3           summing the subsampled predicted frame data and the decimated IDCT output data  
4 to generate video images encoded in a reduced volume of video data.

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6           11.    The invention as recited in claim 10, wherein the act of decimating the  
7 IDCT output by a selected factor comprises the act of decimating the IDCT output by a  
8 first factor in a first direction and a second factor in a second perpendicular direction, such  
9 that the IDCT output is decimated by the selected factor.

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11           12.    The invention as in claim 10, further comprising the act of identifying the  
12 selected factor, the selected factor being identified to reduce the volume of MPEG data that  
13 is to be processed to display the video images and to retain enough video data to display  
14 the video images at the first video resolution.

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16           13.    The invention as in claim 10, wherein the MPEG data, prior to the act of  
17 decimating, is formatted for display on a display device with the first video resolution, the  
18 computer-executable instructions, when executed at the system, further causing the system  
19 to perform the act of displaying the generated video images on a display device having the  
20 second video resolution.

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22           14.    The computer program product as recited in claim 13, wherein:  
23 the display device having the first video resolution is a high definition television; and  
24 the display device having the second video resolution is a standard television.

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15. The computer program product as recited in claim 10, wherein the computer-executable instructions, when executed at the system, further cause the system to perform the act of displaying the video images in a window in a picture-in-picture display, the window having the second video resolution.

1           16.     A system for receiving and processing multiple streams of MPEG data  
2 comprising:

3           a first digital tuner for tuning a first data channel containing a first MPEG data  
4 stream;

5           a second digital tuner for tuning a first data channel containing a second MPEG  
6 data stream;

7           an MPEG decoding module receiving the first MPEG data stream and producing a  
8 first reconstructed video output signal, the MPEG decoding module further receiving the  
9 second MPEG data stream and producing a second reconstructed video output signal with  
10 reduced data, the second reconstructed video output signal being derived from reduced  
11 frequency coefficients and predicted frame data; and

12           a display coupled with the MPEG decoding module for rendering a video image  
13 based on either the first reconstructed video output, the second reconstructed video output,  
14 or a combination of the first and second reconstructed video output signals.

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16           17.     The invention as in claim 16, wherein the MPEG decoding module  
17 includes:

18           a frame prediction module disposed to receive the MPEG data of at least the second  
19 MPEG data stream and disposed to process a reference frame and motion vectors of the  
20 MPEG data to generate predicted frame data;

21           a frequency processing module disposed to transform frequency coefficients of the  
22 MPEG data to a spatial domain to obtain spatial domain data associated with the MPEG  
23 data, and subsampling the spatial domain data by a selected factor to generate subsampled  
24 spatial domain data;

1 a summer for adding the predicted frame data and the subsampled time domain data  
2 to generate video images encoded in a reduced volume of video data; and

3 a frame buffer disposed to buffer frames of the video images.  
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5 18. The invention as in claim 16, wherein the display comprises a picture-in-  
6 picture display coupled to the frame buffer so as to display the second reconstructed video  
7 output in a reduced-size window of the picture-in-picture display, and so as to display the  
8 first reconstructed video output in the remainder of the picture-in-picture display.  
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10 19. The invention as in claim 16, wherein the display comprises a high  
11 definition television.  
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13 20. The invention as in claim 19, wherein the high definition television is  
14 capable of displaying the first reconstructed video output.  
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16 21. The invention as in claim 16, wherein the display comprises a standard  
17 television.  
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19 22. The invention as in claim 21, wherein the standard television is capable of  
20 displaying the second reconstructed video output.